REMARKS/ARGUMENTS

In the present application, claims 1-6 are pending. Claim 4 has been withdrawn from consideration. Claims 1-3, 5, and 6 are rejected. Claim 6 is canceled herein without prejudice or disclaimer. Claims 1-3 and 5 are believed to be in condition for allowance.

Claim Rejections under 35 U.S.C. 103

The examiner rejected claims 1-3 and 5 as being unpatentable over Migdal et al. (U.S. Patent No. 6,417,860) in view of Sara (U.S. Patent No. 4,837,722). With respect to claim 1, the examiner generally contends that Migdal et al. teaches all of the recited claim elements with the exception of the performance of trilinear interpolation in one clock cycle. The examiner further notes that Sara teaches a method of utilizing an architecture and hardware in which color space transformation variables are stored in separate look-up tables so that the necessary points for interpolation calculation may be accessed in parallel in one clock cycle. The examiner then contends that it would have been obvious to one skilled in the art to utilize the method as taught by Sara in combination with the method as taught by Migdal et al. in order to perform interpolation faster.

Applicants respectfully disagree with the examiner's combination of Migdal et al. and Sara. Specifically, nothing in the teachings of Migdal et al. suggest performing interpolation, let alone trilinear interpolation, let alone trilinear interpolation as recited in claim 1 of the present invention. In fact, the methodology of Migdal et al. most specifically teaches away from the trilinear interpolation of the present invention.

Furthermore, while Sara does teach the performance of trilinear interpolation, it is in a context far removed from any field of study or endeavor even tangentially related to the subject matter of Midgal et al. As a result, nothing in Sara teaches or suggests combining the recitations of Sara with that of Migdal et al. so as to collectively recite the limitations of claim 1 of the present invention.

In order to understand the large differences between the teachings of the present invention and that of Migdal et al. and Sara, it is useful to briefly explain the use of trilinear interpolation in the present invention. Trilinear interpolation is the name commonly given to the process of linearly interpolating between points within a three dimensional box when the values of the vertices of the box are known. Trilinear interpolation is most commonly applied in a context involving the interpolation within cells of a volumetric dataset. The present invention is directed, in part, to providing a method for the efficient retrieval of texels from multiple texture spaces, each texture space corresponding to a level of detail (LOD), particularly in the case where the required LOD is not of integer value. For example, the present invention provides a way to compute the texel value of a texel residing at a non-integer level of detail, such as LOD0.6, residing between LOD0 and LOD1. To compute successive levels of detail, the texture space is successively sampled and stored at integer intervals. It is therefore possible to take four texels, forming the corners of a square, from one level of detail as well as the four corresponding points from a successive or preceding level of detail, and use these eight points to form the corners of a cube. As noted above, once the eight corners of a cube are defined, trilinear interpolation allows one to compute an

intermediate value residing anywhere within the three dimensional space formed by the cube.

Claim 1 of the present invention recites numerous elements which facilitate this trilinear interpolation. First of all, there exists a first and second DRAM for storing levels of detail the pixels of which are required for the trilinear interpolation. In addition, there is recited a plurality of data paths to provide data between the first and second DRAM banks and the trilinear interpolator. As such, the present invention allows one to efficiently, within a single clock cycle, perform trilinear interpolation between successive levels of detail and texture space so as to compute intermediate texel values.

In stark contrast to the recitations of claim 1, Migdal et al. clearly teaches away from the use of trilinear interpolation. With specific reference to FIG. 8-B, decision block 844, Migdal et al. teaches the determination of whether or not the texel data for the pixel to be plotted is included within the tile at the LOD. If the texel data is not included, there is mapped a substitute texel data from the tile nearest in level of detail encompassing the texel data at a coarser resolution to the corresponding pixel data. As is clearly evident from this portion of the flowchart, no interpolation is performed in the instance that the required pixel is not located within one of the integer levels of detail. Rather, a simple substitution is performed by accessing texel data at a level of detail one level coarser than the present level under consideration. While such substitution, absent any form of interpolation, is quite quick to perform, it produces inferior visual results resulting in the possible creation of unwanted visual artifacts. Regardless, what is most important about the teachings of Migdal et al., and which is readily evident as discussed herein, is the fact that Migdal et al. performs no

trilinear interpolation as no interpolation of any form is either required, desired, or suggested. In fact, Migdal et al. makes clear in the abstract that "attempts to access a texel lying outside of a particular clip-map tile are accommodated by utilizing a substitute texel value obtained from the next coarser resolution clip-map tile which encompasses the sought texel." There can be no more succinct recitation of the fact that Migdal et al. neither seeks to perform any form of interpolation, let alone trilinear interpolation, nor does it suggest performing any form of interpolation as it is directed to substituting texel values, not interpolating between existing texel values. As such, nothing in Migdal et al. teaches or suggests combining his teachings with that of any other piece of art which recites performing interpolation, trilinear or otherwise.

As an aside, the examiner notes that to better accommodate digital addressing, Migdal et al. teaches that it is preferred that the fringe consist of a multiple of eight texels (Col. 11, lines 36-41). Migdal et al. does state that it is preferred that the fringes "consist of a multiple of eight texels." This refers to a single "fringe" to which is preferably added a multiple of eight texels. Note that Migdal et al. does not recite fringes consisting of eight texels per se, but rather multiples of eight texels. With the exception of the inclusion of the word "eight", there is absolutely no relevance between this observation and the eight texels used in the present invention to perform trilinear interpolation. As noted, trilinear interpolation requires eight and only eight texels, it does not require a multiple of eight texels.

In addition, nothing in the teachings of Sara teach or suggest its combination with any other piece of art in order to recite the limitations of claim 1 of the present invention.

Applicants readily concede that Sara does in fact teach the performance of trilinear interpolation. However, as the examiner notes, Sara is directed to trilinear interpolation within the confines of color space. Color space, whether constructed from red, green, and blue coordinates, or hue saturation, and intensity coordinates, in all cases comprises three orthogonal coordinates each of which may assume continually varying values as opposed to being restricted to integer values. In contrast, the trilinear interpolation of the present invention is performed only between well defined, stratified, horizontally expansive levels of detail comprising texture maps. Therefore, the very coordinate system in which trilinear interpolation of the present invention is performed, is vastly different from that in which the trilinear interpolation of Sara takes place. There is quite simply nothing within the teachings of Sara to teach or suggest trilinear interpolation used to compute texel values between successive levels of detail as is recited in the present invention.

As a result of the foregoing argument, Applicants respectfully contend that there is nothing in the teachings of Migdal et al. or Sara, taken alone or in combination, to teach or suggest the limitations of claim 1. As a result, Applicants respectfully traverse the examiner's grounds for rejection with respect to claim 1. Claim 1 is therefore believed to be in condition for allowance. As claims 2, 3, and 5 depend on claim 1, claim 1 now believed to be in condition for allowance, claims 2, 3, and 5 are likewise believed to be in condition for allowance.

Claim Rejections under 35 U.S.C. 102

The examiner rejected claim 6 as being anticipated by Migdal et al. Claim 6 is herein cancelled without prejudice or

disclaimer. As a result, the examiner's grounds for rejection are rendered moot.

An earnest and thorough attempt has been made by the undersigned to resolve the outstanding issues in this case and place same in condition for allowance. If the Examiner has any questions or feels that a telephone or personal interview would be helpful in resolving any outstanding issues which remain in this application after consideration of this amendment, the Examiner is courteously invited to telephone the undersigned and the same would be gratefully appreciated.

It is submitted that the claims as amended herein patentably define over the art relied on by the Examiner and early allowance of same is courteously solicited.

If any fees are required in connection with this case, it is respectfully requested that they be charged to Deposit Account No. 02-0184.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: "Mail Stop AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on September 22, 2004

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